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REMARKS

Claim 45 is canceled. Claims 1 - 3, 5 - 7, 11 - 13, 16, 17, 19 - 21, 23, 25, 26, 28 - 31, 33, 34, 36, 37, 39, 40, 42, 44, 47, and 51 - 55 have been amended. Support for the amendments can be found in the Specification and claims as filed. More specifically, support for the amendments of Claim 1 can be found in the original Claim 1 as filed and in paragraphs [0228], [0230], [0232], [0233], and [0238] of the Specification as filed. Support for the amendments of Claim 2 can be found in paragraph [0227] of the Specification as filed. Support for the amendments of Claim 6 can be found in the originally filed Claim 1. Support for the amendments of Claim 7 can be found in the originally filed Claim 6. Support for the amendments to Claim 12 can be found in paragraphs [0170]-[0178]. Support for the amendments to Claim 25 can be found in the originally filed Claim 1 and in the paragraphs [0162]-[0166] of the Specification as filed. Support for the amendments to Claim 28 can be found in Claim 25 as originally filed. Support for the amendments to Claim 31 can be found in originally filed Claim 1 and in paragraphs [0162]-[0166] of the Specification as filed. Support for the amendments to Claim 33 can be found in the originally filed Claim 34. Support for the amendments to Claim 44 can be found in Claims 1 and 45 as originally filed and in the paragraphs [0193]-[0198] of the Specification as filed. Amendments not specifically mentioned were introduced to merely improve the clarity of the Claim language. No new matter has been introduced herewith. The following addresses the substance of the current Office Action.

The Examiner has rejected Claims 25, 27 and 32 under 35 U.S.C. 102(b) as being allegedly unpatentable over Richards *et al.* (US 5,143,751). More specifically, the Examiner alleges that "Richards teaches a method of synthesizing a doped lanthanum chromite current passage and porous nickel cermet fuel electrode. Organometallic mixtures are dispersed and mixed with an organic carrier and deposited on the cathode and electrolyte respectively after which the assembly is thermally treated for forming (Col. 3, line 55- Col. 4, line 55 and Col 5, lines 25-41). The ratio of solid and liquid phases is presumably between 1/100 and 15/100 or between 1/3 and 5/7 as the material forms slurry (Col 4, lines 48-52). Powders are treated under vacuum at a temperature below 600°C (col 7, lines 49-65, col 8, lines 23-39 and 59-66)." The Applicants respectfully disagree.

To be anticipatory under 35 U.S.C. § 102, a reference must teach each and every element of the claimed invention. *See Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367,

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1379 (Fed. Cir. 1986). “Invalidity for anticipation requires that all of the elements and limitations of the claim are found within a single prior art reference. ...There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention.” See *Scripps Clinic & Research Foundation v. Genentech, Inc.*, 927 F.2d 1565 (Fed. Cir. 1991).

Richards *et al.* teaches preparation of a highly sinterable lanthanum chromite powder containing a dopant metal by mixing together sources of La, Cr and dopant metals with polycarboxylic acids and polyhydroxyalcohols to form a solution with a desired ratio of La, Cr and dopant metal, followed by a series of temperature treatments to evaporate and subsequently burn off the organic components, grinding the charred material to provide a sinterable material, followed by additional steps of producing a slurry, grinding and heating the resultant particles to obtain the highly sinterable lanthanum chromite powder containing a dopant metal.

Richards *et al.* does not teach producing a current passage by using liquid metal-organic complexes that have the formula: $[\text{CH}_3-(\text{CH}_2)_n-\text{C}(\text{CH}_3)_2-\text{CO}_2]\text{Me}^{+m}$, where n is from 1 to 7, m is a metal valence, and Me is a material selected from the group consisting of Mg, Ca, Sr, Ba, Al, Sc, Y, In, La and lanthanides, Ti, Zr, Hf, Cr, Mn, Fe, Co, Ni, Cu, and the oxides of said metals, applying this liquid mixture directly onto a carrier cathode and subsequently heating this liquid layer to form a gas-dense film (Claim 25). Furthermore, the ratio of solid and liquid phases in a slurry referred to by the Examiner in the Richards *et al.* patent is a slurry of charred material from which the organic components were burned off (column 8 lines 32-39). The ratio of solid and liquid phases in Claim 27 refers to the mixture of a metal-organic powder and metal-organic liquid medium. The temperatures under 600°C used in Richards *et al.* patent refer to steps of producing the powder, not the current passage. Claim 32 of the present invention describes the temperature of making a gas-dense film of the doped lanthanum chromite by heating thin layers of organo-metallic complexes of the invention applied as liquid onto the carrier cathode. Therefore, the Applicants assert that Richards *et al.* does not anticipate Claims 25, 27 and 32.

The Examiner has rejected Claims 1-5, 12-15, 24-29, 33-35, 37 and 38 under 35 U.S.C. 102(e) as being allegedly unpatentable over Mukherjee *et al.* (US 5,919,587). The Applicants respectfully maintain, that Mukherjee *et al.* does not anticipate our invention as presented in the above-recited claims.

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Mukherjee *et al.* discloses and claims composite cathodes for use in an electrochemical cell, that comprise transition metal chalcogenides encapsulating electroactive sulfur-containing cathode material comprising a polysulfide moiety with the formula $-S_m-$, and an electroactive transition metal chalcogenide composition. The chalcogenides are known to be compounds containing sulfur, selenium or tellurium. Moreover, the electroactive transition metal chalcogenides for use in the composite cathodes of Mukherjee *et al.* have a formula $M_jY_k(OR)_t$, and are used to form gel-sol (e.g., a gel-like structure) (see column 21, lines 18-column 22 line 67). The Mukherjee *et al.* patent does not describe a method of manufacturing a high-temperature fuel cell by using a metal-organic complex of the formula: $[CH_3-(CH_2)_n-C(CH_3)_2-CO_2]Me^{+m}$ as claimed in Claims 1-5, 12-15, 24-29, 33-35, 37 and 38 of the present invention. Furthermore, Mukherjee *et al.* does not teach that metal-organic complex of the same general formula can be used in the sequential preparation of all components of the fuel cell in the same apparatus as claimed in Claims 1-5. Therefore, the Applicants maintain that Mukherjee *et al.* does not anticipate Claims 1-5, 12-15, 24-29, 33-35, 37 and 38.

The Examiner has rejected Claims 6, 8-10, 25, 27-30 and 32 under 35 U.S.C. 102(e) as being allegedly unpatentable over Zhen *et al.* (US 6,093,234). More specifically, the Examiner believes that Zhen *et al.* teaches a method of making a fuel cell component by synthesizing a doped lanthanum chromite which is dispersed, ground, mixed in an organic carrier, deposited on a cathode foam and sintered to form a coating. The Applicants respectfully disagree.

Zhen *et al.* teaches the process of preparing ceramic powders by dissolving a metal cation salt, mixing it into a polymeric foam, preferably polyurethane foam, and calcining said foam at a temperature between 400°C and 1400°C to produce uniform particles of 5-300 nm sizes that do not require grinding (Col 4, line 61-col 6, line 17). Zhen *et al.* also teaches pressing the obtained powder followed by sintering (at 1400°C in Example 1 and at 1250°C in Example 2). Zhen *et al.* does not teach a method of manufacturing a high-temperature fuel cell, comprising: jointly precipitating carbonates from a solution of lanthanum nitrate and manganese nitrate, thereby synthesizing a powder of an electrode material comprising a doped lanthanum manganite; mixing this powder with a preparing a formable mass by isostatic compacting of a composition comprising said powder and an organic binding component, wherein said binding component comprises at least one carboxylate of a chemical element selected from the group consisting of

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La, Mn, Ni, Cr and Co, said chemical element being doped with an alkaline-earth element; and heating said formable mass to form a carrier substrate at a temperature not higher than 1380°C (Claim 6 as amended). The Applicants wish to point out that they did not find that a "cermet layer comprising Ni or cobalt may be employed to form the fuel electrode" in col 4 lines 47-56, which lists metal cations suitable for use in preparation of ceramic powders, nor in col 9 lines 26-45, which describe a process for preparing a LiFeO₂ powder, nor in col 11 lines 10-35 which describes preparation of doped zinc oxide powder. Zhen *et al.* does not teach applying a liquid mixture of an electron-conductive material dispersed in a mixture of metal-organic complexes having a formula: [CH₃-(CH₂)_n--C(CH₃)₂-CO₂]_mMe^{+m} onto a carrier cathode and subsequently heating the dispersion to obtain a thin layer (Claim 25) to a temperature that does not exceed 600°C (Claim 32). Therefore, the Applicants assert that Zhen *et al.* does not anticipate Claims 6, 8-10, 25, 27-30 and 32.

The Examiner has rejected Claims 25, 27-30, 44, 46, 51 and 52 under 35 U.S.C. 102(e) as being allegedly unpatentable over Singh *et al.* (US 5,516,597). More specifically, the Examiner believes that Singh *et al.* teaches a method of synthesizing a doped lanthanum chromite current passage and porous nickel cermet fuel electrode by dispersing organometallic mixtures, mixing them with an organic carrier and depositing on the cathode and electrolyte and thermally treating for forming. However, the organometallic compound of Singh *et al.* has the following formulas: M(OR)_x or M(R¹CO₂R²)_x, wherein R, R¹ and R² are alkyl groups and M is cerium, niobium and tantalum (col. 8, lines 31-59). Singh *et al.* does not teach dispersing electron-conductive material comprising doped lanthanum chromite in the organic carrier such as the metal-organic compound of the formula: [CH₃-(CH₂)_n--C(CH₃)₂-CO₂]_mMe^{+m}, wherein Me is a material selected from the group consisting of Mg, Ca, Sr, Ba, Al, Sc, Y, In, La and lanthanides, Ti, Zr, Hf, Cr, Mn, Fe, Co, Ni, Cu (as claimed in currently amended Claims 25, and 27-30). Singh *et al.* does not teach the method of manufacturing cermet fuel electrode, wherein the liquid phase mixed with the powders of electron-conductive material comprises the formula [CH₃-(CH₂)_n--C(CH₃)₂-CO₂]_mMe^{+m}, wherein Me is selected from the group consisting of Ni and Co as claimed in currently amended Claims 44, 46, 51 and 52. Therefore, the Applicant respectfully asserts that Singh *et al.* does not anticipate amended Claims 25, 27-30, 44, 46, 51 and 52.

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The Examiner has rejected Claims 16, 18, 19 and 32 under 35 U.S.C. 103(a) as being allegedly unpatentable over Mukherjee *et al.* (US 5,919,587) in view of Zhen *et al.* (US 6,093,234). More specifically, the Examiner believes that it would have been obvious at the time the invention was made to optimize the processing temperatures for the materials employed to enhance ionic transport and prevent large increases in internal cell resistance. Applicants respectfully disagree.

To establish a *prima facie* case of obviousness, the PTO must cite one or more references that provide some suggestion or motivation to modify the references to achieve the claimed invention, provide a reasonable expectation of success to achieve the claimed invention, and finally, the cited art must teach or suggest all the claim limitations. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). Here, the cited art either taken alone or in combination, fails to provide any of the required factors.

No motivation to combine

The cited art fails to support a *prima facie* case of obviousness because neither reference provides a suggestion or motivation to modify or combine the references to achieve the claimed invention. Mukherjee *et al.* teaches cathodes for use in an electrochemical cell, that comprise transition metal chalcogenides encapsulating electroactive sulfur-containing cathode material comprising a polysulfide moiety with the formula $-S_m-$, and an electroactive transition metal chalcogenide composition. The electrochemical cell of Mukherjee *et al.* requires an organic compound as its working medium, where the metal chalcogenide is dissolved. The working medium of the high-temperature fuel cell is a high-density non-porous ceramic assigned to work at temperatures between 800 and 1000°C. The acceptable electrical conductivity of this ceramic arises only at the temperatures over 600°C. Therefore, this ceramic can not be used in electrochemical cells taught by Mukherjee. Therefore, the applicants assert that a person skilled in the art would not be motivated to combine teachings of Mukherjee *et al.* and Zhen *et al.* to manufacture a solid oxide electrolyte (Claims 16, 18 and 19) or a current passage (Claim 32).

No reasonable expectation of success

The cited art fails to support a *prima facie* case of obviousness because neither reference provides a reasonable expectation of success in practicing the claimed invention by combining the teachings of the cited art.

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Zhen *et al.* teaches a process of preparing Y_2O_3 stabilized ZrO_2 (YSZ) which can be used in electrolytes of solid oxide fuel cells. However, YSZ placed in the medium of an electrochemical cell of Mukherjee *et al.* would be poisoned by the sulphur present in such medium. Therefore, the applicants assert that a person skilled in the art would not have been motivated to combine teachings of Mukherjee *et al.* and Zhen *et al.* to manufacture a solid oxide electrolyte (Claims 16, 18 and 19) or a current passage (Claim 32).

In view of these shortcomings, Applicants submit that the references cited by the PTO fail to support a *prima facie* case of obviousness and respectfully request withdrawal of the rejections of Claims 16, 18, 19 and 32 under 35 U.S.C. 103(a).

The Examiner has rejected Claims 20-22, 30, 39-47 and 49-56 under 35 U.S.C. 103(a) as being allegedly unpatentable over Mukherjee *et al.* (US 5,919,587) in view of Jensen (US 5,141,825). More specifically, the Examiner believes that it would have been obvious to one of ordinary skill in the art at the time the invention was made that Ce oxides are equivalents for Zr oxides in fuel cell materials and that Ni and/or Co anodes are conventional. The Examiner further believes that by using materials with small particle size in an inert atmosphere, corrosion is prevented while improving efficiency and utilization. The Applicants respectfully disagree.

No motivation to combine

The cited art fails to support a *prima facie* case of obviousness because neither reference provides a suggestion or motivation to modify or combine the references to achieve the claimed invention. Mukherjee *et al.* teaches cathodes for use in an electrochemical cell, that comprise transition metal chalcogenides encapsulating electroactive sulfur-containing cathode material comprising a polysulfide moiety with the formula $-S_m-$, and an electroactive transition metal chalcogenide composition. Jensen teaches an electrode attached to a solid electrolyte material which comprises yttria stabilized zirconia (YSZ). YSZ placed in the medium of an electrochemical cell of Mukherjee *et al.* would be poisoned by the S_2 present in such medium. Therefore, the applicants assert that a person skilled in the art would not have been motivated to combine teachings of Mukherjee *et al.* and Jensen to produce a solid oxide electrolyte of Claim 20-22, a current passage of Claim 30, an interface layer of Claims 39-47, a cermet fuel electrode

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of Claims 49-53, an electrical insulating layer of Claims 54 and 55, or a high-temperature fuel cell.

No reasonable expectation of success

The cited art fails to support a *prima facie* case of obviousness because neither reference provides a reasonable expectation of success in practicing the claimed invention by combining the teachings of the cited art.

The Examiner has rejected Claims 17 and 31 under 35 U.S.C. 103(a) as being allegedly unpatentable over Mukherjee et al. (US 5,919,587) in view of Pal et al. (US 4,895,576). More specifically, the Examiner believes that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ a conventional growth rate to quickly form electrodes with high cell efficiency and utilization which are not easily poisoned by sulfur. The Applicants respectfully disagree.

The cited art fails to teach all the claimed limitations

The final requirement for a *prima facie* case of obviousness is that the references, either alone or in combination, teach or suggest all of the limitations of the pending claims. As discussed above, neither the Mukherjee et al. reference nor the Pal et al. reference teach or suggest all the method steps by which the solid oxide electrolyte or a current passage of the high-temperature fuel cell can be produced. More specifically, neither Mukherjee et al. nor Pal teach the step of synthesizing a metal-organic compound of the following formulas: $\text{Me}^{+A}(\text{O}_2\text{C}-\text{C}(\text{CH}_3)_2-(\text{CH}_2)_n-\text{CH}_3)_x(\text{OC}_m\text{H}_{2m+1})_{A-x}$ (Claim 17) and $[\text{CH}_3-(\text{CH}_2)_n-\text{C}(\text{CH}_3)_2-\text{CO}_2]_m\text{Me}^{+m}$ (Claim 31). Because both of these reference clearly fail to teach or suggest all the limitations of the claimed invention, neither reference taken alone or in combination, can be said to support a *prima facie* case of obviousness. Therefore, Applicants submit that the PTO has failed to articulate a *prima facie* case of obviousness, and as such, the present rejection of Claims 17 and 31 under 35 U.S.C. 103 should be withdrawn.

The Examiner has rejected Claim 31 under 35 U.S.C. 103(a) as being allegedly unpatentable over Singh et al. (US 5,516,597) in view of Pal et al. (US 4,895,576). More specifically, the Examiner believes, that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ a conventional growth rate to quickly form electrodes with good electrical, chemical and mechanical properties. The Applicants respectfully disagree.

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Singh *et al.* teaches a method of synthesizing a doped lanthanum chromite current passage and porous nickel cermet fuel electrode by dispersing organometallic mixtures, mixing them with an organic carrier and depositing on the cathode and electrolyte and thermally treating for forming. However, the organometallic compound of Singh *et al.* has the following formulas: $M(OR)_x$ or $M(R^1CO_2R^2)_x$, wherein R, R^1 and R^2 are alkyl groups and M is cerium, niobium and tantalum (col. 8, lines 31-59). Singh *et al.* does not teach dispersing electron-conductive material comprising doped lanthanum chromite in the organic carrier such as the metal-organic compound of the formula: $[CH_3-(CH_2)_n-C(CH_3)_2-CO_2]Me^{+m}$, wherein Me is a material selected from the group consisting of Mg, Ca, Sr, Ba, Al, Sc, Y, In, La and lanthanides, Ti, Zr, Hf, Cr, Mn, Fe, Co, Ni, Cu as in currently amended Claim 31. Pal reference fails to cure the main deficiency of the Singh *et al.* reference in respect to the currently amended Claim 31, therefore Applicants respectfully request withdrawal of the present rejection of Claim 31 under 35 U.S.C. 103.

The Examiner has rejected Claim 48 under 35 U.S.C. 103(a) as being allegedly unpatentable over Singh *et al.* (US 5,516,597) in view of Xue (US 5,702,837). More specifically, the Examiner believes that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use equal amounts of electrolyte material (Ce or Zr) and metal (Ni and/or Co) to improve cell efficiency, life expectancy and mechanical properties in a simple and reliable manner. The Applicants respectfully disagree.

Singh *et al.* does not teach the method of manufacturing cermet fuel electrode, wherein the liquid phase mixed with the powders of electron-conductive material comprises the formula $[CH_3-(CH_2)_n-C(CH_3)_2-CO_2]Me^{+m}$, wherein Me is selected from the group consisting of Ni and Co as claimed in currently amended independent Claim 44 on which Claim 48 depends. Xue fails to cure this deficiency of the Singh *et al.* reference in respect to Claim 48, therefore Applicants respectfully request withdrawal of the present rejection of Claim 48 under 35 U.S.C. 103.

The Examiner has rejected Claim 48 under 35 U.S.C. 103(a) as being allegedly unpatentable over Mukherjee *et al.* (US 5,919,587) in view of Jensen (US 5,141,825) as applied to claim 44 above, and further in view of Xue (US 5,702,837). More specifically, the Examiner believes that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use equal amounts of electrolyte material (Ce or Zr) and metal

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(Ni and/or Co) to improve cell efficiency and utilization. Such a composition is simple, conveniently formed and not easily poisoned by sulfur. The Applicants respectfully disagree.

Mukherjee *et al.* does teach the step of synthesizing a metal-organic compound of the following formulas: $[\text{CH}_3-(\text{CH}_2)_n-\text{C}(\text{CH}_3)_2-\text{CO}_2]\text{Me}^{+m}$, wherein Me is selected from the group consisting of Ni and Co as claimed in currently amended independent Claim 44 on which Claim 48 depends. Neither Jensen nor Xue can cure this deficiency of the Mukherjee *et al.* reference, therefore, Applicants respectfully request withdrawal of the present rejection of Claim 48 under 35 U.S.C. 103.

Allowable Subject Matter

The Examiner has indicated that Claims 7, 11, 23 and 36 would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. The Applicants have amended Claims 7, 11, 23 and 36 per the Examiner's suggestions.

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CONCLUSION

For the foregoing reasons, it is respectfully submitted that the rejections set forth in the outstanding Office Action are inapplicable to the present claims. Accordingly, Applicants request the expeditious allowance of the pending claims.

The undersigned has made a good faith effort to respond to all of the rejections in the case and to place the claims in condition for immediate allowance. Nevertheless, if any undeveloped issues remain or if any issues require clarification, the Examiner is respectfully requested to call the undersigned at the number below, to discuss such issues.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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